

Claims

1. In a digital data processing apparatus for managing a storage area network (SAN), the improvement comprising:

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a first queue of one or more tasks,

a second queue of one or more data that correspond to each of the respective tasks, the data being grouped in the second queue in accord with the task to which they correspond,

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a manager service, coupled to at least the first queue, that updates an internal representation of the SAN by executing the tasks in the first queue one at a time, each task executing using data of the second queue that correspond to that task.

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2. In a digital data processing apparatus of claim 1, the improvement wherein the tasks are object oriented programming (OOP) objects.

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3. In a digital data processing apparatus of claim 1, the improvement wherein the manager service executes the tasks atomically.

4. In a digital data processing apparatus of claim 3, the improvement wherein each task processes sequentially data from the second queue that correspond to that task.

5. In a digital data processing apparatus of claim 1, the improvement wherein the internal representation represents a topology of the SAN.

6. In a digital data processing apparatus of claim 1, the improvement comprising a detection service in communication coupling with the manager service that generates the data in response to changes in the SAN.

7. In a digital data processing apparatus of claim 6, the improvement wherein the data are notifications.

8. In a digital data processing apparatus of claim 6, the improvement wherein the manager service selectively adds tasks and data to the first queue and to the second queue, selectively and respectively, in response to data generated by the detection service.

9. In a digital data processing apparatus of claim 8, the improvement wherein the manager service sequentially adds data generated by the detection service to the second queue until generation of selected data.

10. In a digital data processing apparatus of claim 9, the improvement wherein the manager service responds to the selected data by generating a task for updating the internal representation of the SAN.

11. In a digital data processing apparatus of claim 9, the improvement wherein the manager service responds to a selected operator request by generating a task for updating the internal representation of the SAN.

5 12. In a digital data processing apparatus for managing a storage area network (SAN), the improvement comprising:

a detection service that generates notifications of changes in the SAN,

10 a manager service, in communication coupling with the detection service, that sequentially queues selected ones of the notifications to a notification queue and that responds to one or more selected notifications by queuing a task to a task queue,

15 the manager service updating an internal representation of the SAN by executing tasks in the task queue one at a time, each task executing with one or more notifications from the notification queue that correspond to the same change in the SAN.

13. In a digital data processing apparatus of claim 12, the improvement wherein each task executes with one or more notifications from the notification queue that were generated prior to
20 the selected notification corresponding to the same change in the SAN.

14. In a digital data processing apparatus of claim 12, the improvement wherein the notifications in the notification queue are grouped in accord with the change in the SAN with which they correspond.

5 15. In a digital data processing apparatus of claim 12, the improvement wherein the manager service executes the tasks atomically and wherein each task processes the notifications from the notification queue sequentially.

10 16. In a digital data processing apparatus of claim 12, the improvement wherein the manager service responds to a selected operator request by generating a task for updating the internal representation of the SAN.

15 17. In a digital data processing apparatus of claim 12, the improvement wherein, the notifications include one or more of a new component notification, a modified attribute notification, a missing component notification, and a missing relationship notification.

18. In a digital data processing apparatus of claim 12, the improvement wherein the service manager executes tasks from the task queue on a first-in-first-out (FIFO) basis.

20 19. In a digital data processing apparatus of claim 12, the improvement wherein the service manager executes tasks from the task queue on a basis of priority.

20. In a digital data processing apparatus for managing a storage area network (SAN), the improvement comprising:

one or more scan elements, each of which is coupled to one or more components of the
5 SAN and which identifies attributes with respect thereto,

a detection service in communication coupling with the scan elements that determines
from the identified attributes changes in the SAN and generates one or more of notifications
corresponding to each change,

10 a manager service, in communication coupling with the detection service, that
sequentially queues selected ones of the notifications to a notification queue and that responds to
one or more selected notifications by queuing a task to a task queue,

15 the manager service updating an internal representation of the SAN by executing tasks in
the task queue one at a time, each task executing with one or more notifications from the
notification queue that correspond to the same change in the SAN.

21. In a digital data processing apparatus of claim 20, the improvement wherein the detection
20 service compares attributes identified by a scan element with attributes previously identified by
the scan element to determine whether there has been a change in the SAN.

22. In a method of managing a storage area network of the type comprising one or more hosts connected to one or more storage devices via an interconnect fabric, the improvement comprising:

5 identifying changes in the SAN and generating one or more of notifications corresponding to each change,

sequentially queuing selected ones of the notifications to a notification queue,

10 responding to one or more selected notifications by queuing a task to a task queue,

updating an internal representation of the SAN by executing tasks in the task queue one at a time, each task executing with one or more notifications from the notification queue that correspond to the same change in the SAN.

15 23. A storage area network, comprising:

one or more hosts connected to one or more storage devices,

20 one or more agents each associated with one of the hosts, each agent monitoring topology of the SAN, the agents identifying attributes of any of (i) the host with which it is associated, (ii) the interconnect to which that host is coupled, and (iii) storage units to which that host is coupled,

a manager service in communication coupling with the agents, the manager service comprising:

5 a discover module that identifies changes in the SAN based on attributes identified by the agents and generates one or more notification corresponding to each such change,

10 a service module in communication with the discover module that receives the events and the event notifications from the discover module,

15 the service module generating a first queue having entries representing notifications received from the discover engine and a second queue representing tasks for updating an internal representation of the database,

20 the service module sequentially processing entries in the second queue and, with each, one or more entries from the first queue representing notifications corresponding to the same change.